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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference H0888PCT/HdG/R	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/NL 98/ 00051	International filing date (day/month/year) 23/01/1998	(Earliest) Priority Date (day/month/year) 23/01/1997
Applicant HOOGOVENS STAAL B.V. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).

2. ☐ Unity of invention is lacking (see Box II).

3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.

☐ furnished by the applicant separately from the international application,

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ Transcribed by this Authority

4. With regard to the title, ☒ the text is approved as submitted by the applicant

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

Figure No. 1 ☒ as suggested by the applicant.

☐ None of the figures.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NL 98/00051

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The following reference numbers have been added:
In line 1: "...substrate (1) with a band (3)..."
In line 4: "...roll (5, 5a)"
In line 12: "...substrate (1) with the plastic band (3)..."

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 98/00051

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B32B31/30 B32B15/08 B29C39/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 407 702 A (SMITH DAVID A ET AL) 18 April 1995 see column 1, line 1 - column 4, line 38 see figures ---	1-10, 13
X	WO 93 24324 A (BASF LACKE & FARBEN ;KIRIAZIS LEONIDAS (DE)) 9 December 1993 see the whole document ---	1, 3, 5, 13
P, A	WO 97 32715 A (TOYO KOHAN CO LTD ;OKAMURA TAKAAKI (JP); OHHASHI YASUO (JP); NAKAM) 12 September 1997 see abstract; figures ---	1, 3
X	EP 0 067 060 A (TAIYO STEEL) 15 December 1982 see page 2, line 8 - page 4, line 19 see page 7, line 2 - line 11 --- -/--	6-10



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

14 April 1998

Date of mailing of the international search report

24/04/1998

Name and mailing address of the ISA

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Authorized officer

Lanaspeze, J

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 98/00051

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 095, no. 005, 30 June 1995 & JP 07 041744 A (HOKKAI CAN CO LTD), 10 February 1995, see abstract ---	11,12
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 591 (C-1125), 28 October 1993 & JP 05 177168 A (SUMITOMO METAL IND LTD), 20 July 1993, see abstract ----	11,12
A	WO 96 09169 A (EASTMAN CHEM CO) 28 March 1996 -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 98/00051

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5407702 A	18-04-95	NONE	
WO 9324324 A	09-12-93	DE 4218369 A AT 158985 T AU 670096 B AU 4320793 A CA 2136746 A	09-12-93 15-10-97 04-07-96 30-12-93 09-12-93
		DE 59307521 D EP 0689505 A NO 944649 A ZA 9303713 A	13-11-97 03-01-96 02-12-94 15-12-93
WO 9732715 A	12-09-97	AU 5778896 A	22-09-97
EP 0067060 A	15-12-82	JP 1680842 C JP 3041342 B JP 57203545 A	13-07-92 21-06-91 13-12-82
WO 9609169 A	28-03-96	ZA 9508048 A	22-04-96

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 05 October 1998 (05.10.98)	Applicant's or agent's file reference HO886PCT/HdG/R
International application No. PCT/NL98/00051	Priority date (day/month/year) 23 January 1997 (23.01.97)
International filing date (day/month/year) 23 January 1998 (23.01.98)	
Applicant BEENTJES, Petrus, Cornelis, Jozef	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
20 August 1998 (20.08.98)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer:

Marie-José Devillard


Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference HO888PCT/HdG/R		FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/NL98/00051		International filing date (day/month/year) 23/01/1998	Priority date (day/month/year) 23/01/1997	
International Patent Classification (IPC) or national classification and IPC B32B31/30				
Applicant HOOGOVS STAAL B.V. et al.				
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 8 sheets.</p>				
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input checked="" type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 				
Date of submission of the demand 20/08/1998		Date of completion of this report 2. 05. 99		
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0 Tx: 523856 epmu d Fax: (+49-89) 2399-4465		Authorized officer Okunowski, J Telephone No. (+49-89) 2399 8975		



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NL98/00051

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-6 with telefax of 05/05/1999

Claims, No.:

1-5 with telefax of 05/05/1999

Drawings, sheets:

1/3-3/3 filed with the demand

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☒ the claims, Nos.: 6-13
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NL98/00051

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-5
	No: Claims
Inventive step (IS)	Yes: Claims
	No: Claims 1-5
Industrial applicability (IA)	Yes: Claims 1-5
	No: Claims

2. Citations and explanations

see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NL98/00051

Reference is made to the following documents:

D1: US-A-5 407 702

D2: WO 93/24324

Item V

1. None of the documents disclose the features of the present claims which relate to the starting-up phase of the process (the starting-up implies the necessary apparatus features in the apparatus of claim 3. The process of claim 1 will at a given time leave the starting-up phase, but a process also implies an apparatus on which the process is carried out, and this apparatus will then still show the features necessary to carry out the starting-up procedure). These features are, for claim 1:

- the features of part (iii) of claim 1;
- bringing the plastic strip and the substrate up to speed;
- the features of part (v) of claim 1.

Also, none of the documents on file explicitly discloses in-line or on-line thickness monitoring, colour monitoring, strip tension monitoring or width trimming, as defined in present claim 1.

Furthermore, as far as claim 3 is concerned, none of the prior art documents discloses the contact roll to be movable in the sense of present claim 3, a feature which is related to the starting-up features of present claim 1.

The subject-matter of the present claims is therefore considered to be novel (Article 33(2) PCT).

2. The disclosure of D2 (see e.g. Example 1) is considered to represent the closest prior art. In the general process description of D2, beginning on page 5, line 8, there is no explicit statement that the film is laminated onto the metal directly after extrusion and cooling. However, there is no mention at all in the description of the subject-matter of D2 of any intermediate step or intermediate storage, and the general description of D2 implicitly strongly suggests direct lamination after extrusion/cooling (see also page 11, lines 13 to 31). Processes with intermediate

↳ individual.

~~extrudate storage are mentioned in D2 only in the description of the prior art to~~
D2, and such descriptions have no bearing on the teaching of D2 itself.

Claim 4 of D2, finally, discloses explicitly that the plastic film is laminated onto the metal sheet directly after extrusion.

D2 is therefore considered to disclose all features of present claims 1 and 3 except the above-mentioned features, which are considered to be the distinguishing features of present claims 1 and 3 over the closest prior art.

However, the problem to be solved in the present application is indicated to be (reference is made to the English translation of the Dutch original) to avoid delamination of plastic coating laminated onto a metal substrate, while at the same time avoiding polymer degradation caused by excessive exposure of the plastic coating to heat (see page 2, 2nd paragraph together with the preceding prior art discussion). The solution to these problems should evidently reside in the continuous (steady-state) part of the lamination process. The description of the present application seems to suggest that the solution is offered by heating the metal substrate prior to lamination of the cooled plastic material, but this feature is already known from D2.

There are at any rate no indications in the application as originally filed that the distinguishing features as identified above give rise to effects which might offer a solution to the problem. The distinguishing features of present claims 1 and 3 over the closest prior art can therefore not be seen to substantiate the involvement of an inventive step, and the subject-matter of these claims does therefore not comply with Article 33(3) PCT.

3. The additional features of present claim 5 is known from D1. The additional features of present claims 2 and 4 would, insofar as they are not already known from D1 or D2, not seem to be related to a solution to the problem as identified above.

The subject-matter of present claims 2, 4 and 5 would therefore not seem to involve an inventive step (Article 33(3) PCT).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NL98/00051

Item VI

Document WO 97/32715 has a filing date of 23/05/1996, which is before the presently claimed priority dates, and a publication date of 12/09/1997, which is before the present filing date, but after the presently claimed priority dates. Thus, depending upon the validity of the present priority claims, this document can be prior art under Rule 64.1 PCT or under Rule 64.3 PCT.

However, its disclosure seems to fall outside the scope of the present claims, and also not to teach more than can already derived from the other cited documents. Its status would therefore at present not seem to be an issue of great importance.

Item VII

1. The independent claims have not been drafted in the two part form bearing reference to the closest prior art (Rule 6.3(b) PCT).
2. It would seem that the acknowledgement of D2 in the present description does not reflect D2's actual teaching (Rule 5.1(a)(ii) PCT).

Item VIII

The following objection is raised for lack of clarity of the claims (Article 6 PCT).

1. The definition "close to the softening temperature" as lower limit for the metal temperature is vague.

METHOD AND APPARATUS FOR STRIP-COATING A METALLIC STRIP-SHAPED SUBSTRATE WITH A PLASTIC STRIP AND STRIP THUS OBTAINED

The invention relates to a method for strip-coating a metallic strip-shaped substrate with a thin strip of plastic, an apparatus for carrying out the method as well as to the coated strip obtained with the method.

There are at least two methods known for manufacturing a coated product comprising a metal substrate and a plastic layer adhering to it, namely film-laminating and extrusion-coating.

In the case of film-laminating, a finished plastic film is unrolled and applied onto the metal substrate, as disclosed in e.g. WO 93/24324.

In the case of extrusion-coating a sheet of plastic is applied onto the metal substrate directly or virtually directly from an extruder, as disclosed in e.g. EP 0 067 060 A1.

In the case of the first method a roll of finished film is taken as starting material. A problem in making a roll of film is rolling it up. The film tends to stick to itself so that the windings cling to each other. Because in its rolled up state the film shrinks somewhat, the roll has to be rolled up loosely to enable it to be unrolled once again in a controlled way. Inevitable stresses in the film then easily cause edge build-up, the roll becomes unround, and the film displays spacing tracks when being unrolled. Among other things this makes the film incapable of being unrolled without difficulty at a sufficiently high speed; if this does succeed then there remains the problem that at higher rolling off speeds electrostatic discharge symptoms need to be reckoned with. To avoid such difficulties additives are added to for example household foils; in the case of film-lamination this solution offers

no remedy because the additives unacceptably reduce the capacity to adhere to the metal substrate.

On the face of it extrusion-coating would therefore seem an interesting alternative, and so it is for a small number of applications, namely those whereby the plastic involved has the correct adhesion properties in molten state. When this is no longer the case, or not adequately so, and molecules need to be incorporated in the plastic to migrate to the surface in order to accomplish adhesion, in the case of extrusion-coating the problems occur, at least where a high coating speed is desired. This is because adhesion groups only migrate fast enough, i.e. within tenths of a second, if a sufficiently high temperature can be maintained during the coating. This is only possible when coating onto one side of the substrate. The required high temperature then also makes it impossible subsequently to coat the other side because the previously applied coating becomes unacceptably damaged on the second exposure to the high temperature. Even non-subsequent but simultaneous two-sided extrusion-coating is no solution because in the case of extrusion-coating the slightest deviation in substrate thickness and the slightest disturbance in the process would cause unstable process operation and consequently coating differences and inhomogeneities on each side.

The problems surrounding the procedures outlined are resolved or at least largely reduced if worked in accordance with the invention.

The method in accordance with the invention is characterised in that it comprises in combination the stages

- (i) in-situ casting of a plastic strip;
- (ii) leading the plastic strip around a preferably internally water-cooled cooling roll;
- (iii) leading away the plastic strip until the plastic strip production is underway and

stabilised;

- (iv) bringing the plastic strip and the substrate up to speed and heating the substrate to a temperature of the substrate close to or above the softening temperature of the part of the plastic strip facing the substrate;
- (v) pressing the plastic strip onto the substrate and where applicable breaking off the plastic strip and stopping it being led away, while the substrate and the cooling roll are connected by the plastic strip;
- (vi) coating the substrate with the plastic strip at high speed.

This achieves the effect of enabling a considerably thinner plastic layer to be applied onto the metal strip in a controlled and economically viable manner.

It is remarked that US 5,407,702 discloses a method for coating a metal strip with a polymer extrudate which extrudate after extrusion is firstly brought into contact with a surface having a temperature which will promote sticking or clinging of the extrudate thereto. A typical temperature for this purpose is said to be in the range of about 120 °C to 180 °C.

The invention is also embodied in an apparatus for the continuous strip-coating of a metal substrate with a layer of plastic.

Finally the invention is further embodied in a strip-coated packaging steel.

The invention will now be further illustrated by reference to the drawing comprising Figures 1, 2 and 3 each of which show a possible line drawing for coating in accordance with the invention, and several non-limitative examples with references to the Figures.

Example 1

An ECCS substrate (1) (also known as TFS) with a thickness of 0.20 mm. This

substrate is heated to a temperature of 230 °C by means of heating (2), for example comprising heated guide rolls and/or on the basis of induction, hot air or otherwise. A plastic strip (3) such as a PET plastic strip is produced by applying on each side of substrate (1) molten PET via nozzle (4), (4a) on an internally water-cooled guide roll (5), (5a). The cooled PET strip (3) is then conveyed to the rubber coated contact roll (6). As it travels it is possible to monitor the thickness, colour and strip tension and to trim to the correct width. The thickness of the two strips (3) is between 3 and 100 μm . Prior to commencement of coating the contact rolls (6) do not touch substrate (1), and the two strips are conveyed off, for example rolled up on winders (7).

In order to begin coating, contact rolls (6) are closed, i.e. moved towards substrate (1).

PET strips (3) adhere to substrate (1) and almost simultaneously the pieces of strip (3) between contact roll (6) and winder (7) are cut through. The rubber of rolls (6) is cooled externally, for example by metal cooling roll (8), or by an air-blade on the rubber surface. The coated strip is then subjected to a brief extra heat treatment to 260 °C in order to optimise adhesion. A good product results, particularly suitable for example for the covers of three-piece cans.

Example 2

As in Example 1 but now on the one side of substrate (1) the plastic flowing from nozzle (4a) is a two-layer polypropylene, whereby one of the layers, the adhesion layer, is maleic acid anhydride modified polypropylene; on the other side of the substrate a PET strip is manufactured and supplied via nozzle (4) and cooling roll (5). In this case the preheating temperature of substrate (1) is 200 °C. The thickness of the two strips is between 3 and 100 μm . During the initial contact of the two-layer strip with the substrate

at 200 °C, a temperature above the melting temperature of polypropylene, there is already some adhesion onto substrate (1), while the polypropylene top layer neither sticks to or is damaged by the rubber of contact roll (6) that has a temperature of approx. 90 °C. This adhesion to substrate (1) attains its maximum after approx. 1 second. The coated strip is then subjected to a brief extra heat treatment, for example to 260 °C, in order to optimise the adhesion of both PET and modified PP. A product results, for example particularly suitable for beer bottle crown closures.

Example 3

As in example 1 but now both plastic strips are two-layer polypropylene. Substrate (1) is 0.10 mm thick ECCS and is heated to a temperature of 230 °C. Now a product results with a PP layer on both sides. The higher temperature than in example 2 is necessary because of the low heat content of thin substrate. The product is particularly suitable for example for animal food packaging.

Figures 1, 2 and 3 show different line drawings in accordance with the invention of coating a metal substrate with an in-line manufactured plastic strip. Fig. 2 shows a vacuum chamber (20), an electrostatic edge limiter (9), an air-blade (10) for cooling, a thickness gauge (11), an edging knife (12), a cutting waste extractor installation (13), a temperature gauge (14) and a furnace (15) for heating the coated strip.

It is possible to stretch the plastic strip at a temperature above the glass transition temperature and below the softening temperature of the plastic; in the case of uni-axial stretching an elongation of up to 400% is conceivable. If desired it is possible to provide the plastic strip with openings.

To the expert it will be clear that the invention can be applied for single-side or two-side coating of a metallic substrate with on each side the same plastic, or a different

plastic for example PET or polypropylene or on one side polypropylene and on the other side PET.

CLAIMS

1. Method for strip-coating a metallic strip-shaped substrate with a strip of plastic comprising the successive stages
 - (i) in-situ casting of a plastic strip;
 - (ii) leading the plastic strip around a preferably internally water-cooled cooling roll;
 - (iii) leading away the plastic strip between an opened contact roll and the substrate until the plastic strip production is underway and stabilised;
 - (iv) bringing the plastic strip and the substrate up to speed and heating the substrate to a temperature of the substrate close to or above the softening temperature of the part of the plastic strip facing the substrate;
 - (v) pressing the plastic strip onto the substrate by closing the contact roll and where applicable breaking off the plastic strip and stopping it being led away, while the substrate and the cooling roll are connected by the plastic strip;
 - (vi) coating the substrate with the plastic strip at high speed;while performing on the plastic strip as it travels between cooling roll and contact roll at least one of monitoring its thickness, monitoring its colour, monitoring strip tension and trimming its width.
2. Method in accordance with Claim 1, characterised in that after the plastic strip has been applied an extra heat treatment stage follows in order to improve adhesion.
3. Apparatus for strip-coating a metallic strip-shaped substrate with a strip of plastic

in accordance with claim 1, comprising in combination:

- means of conveying the metal substrate;
- a contact roll for pressing the plastic strip onto the substrate;
- means of casting for casting the plastic;
- a cooling roll for the formation of a plastic strip;
- means of feeding and guiding for bringing the plastic strip to the substrate via the contact roll;

wherein the contact roll is movable to a first position apart from the substrate wherein it is suitably arranged to co-operate with a means of conveying off the plastic strip and to a second position relative to the substrate wherein it is suitable to press the plastic strip onto the substrate.

4. Apparatus in accordance with Claim 3, characterised in that the contact roll is rubber at least on a surface with which it comes into contact with the plastic strip.
5. Apparatus in accordance with Claims 3 or 4, characterised in that the means of conveying substrate, the contact roll, the means of casting, the cooling roll and the means of feeding and guiding are essentially duplicated, one set on each side of where the substrate is situated during operation for simultaneously two-sided coating the substrate.

PCT

20. 02. 98

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/NL 98 / 00051

International Application No.

23 JAN 1998

(23. 01. 98)

International Filing Date

BUREAU VOOR DE INDUSTRIËLE EIGENDOM
P.C.T. INTERNATIONAL APPLICATION

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference

(if desired) (12 characters maximum)

H0888PCT/HdGZR

Box No. I TITLE OF INVENTION

Method and apparatus for strip-coating a metallic strip-shaped substrate with a plastic band and strip thus obtained.

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

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35211 hovs nl

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State (i.e. country) of residence:

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This person is applicant
for the purposes of:

☐ all designated
States

☒ all designated States except
the United States of America

☐ the United States
of America only

☐ the States indicated in
the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

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Cieweg 43
1902 AA CASTRICUM
The Netherlands

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box
is marked, do not fill in below.)

State (i.e. country) of nationality:

The Netherlands

State (i.e. country) of residence:

The Netherlands

This person is applicant
for the purposes of:

☐ all designated
States

☐ all designated States except
the United States of America

☒ the United States
of America only

☐ the States indicated in
the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

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The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Box N . VI PRIORITY CLAIMFurther priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1) NL	18 February 1997 (18-02-1997)	1005304	
item (2) NL	23 January 1997 (23-01-1997)	1005066	
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s) : 1 and 2.
Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA / EP

Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:

Country (or regional Office): EPO Date (day/month/year): 10-10-1997 Number: NL-1005304

Box No. VIII CHECK LIST

This international application contains the following number of sheets:

1. request : 3 sheets
 2. description : 5 sheets
 3. claims : 3 sheets
 4. abstract : 1 sheets
 5. drawings : 3 sheets

Total : 15 sheets


This international application is accompanied by the item(s) marked below:

1. ☐ separate signed power of attorney
 2. ☐ copy of general power of attorney
 3. ☐ statement explaining lack of signature
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 5. ☒ fee calculation sheet
 6. ☐ separate indications concerning deposited microorganisms
 7. ☐ nucleotide and/or amino acid sequence listing (diskette)
 8. ☐ other (specify):

Figure No. 1 of the drawings (if any) should accompany the abstract when it is published.

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



ir. J.W. Herman de Groot, Patent Counsel

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1. Date of actual receipt of the purported international application: 23 JAN 1998 (23. 01. 98)	2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:
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WERKWIJZE EN INRICHTING VOOR BANDBEKLEDEN VAN EEN
METALLISCH BANDVORMIG SUBSTRAAT MET EEN KUNSTSTOFBAAN EN
ALDUS VERKREGEN BAND

De uitvinding heeft betrekking op een werkwijze voor bandbekleden van een metallisch bandvormig substraat met een dunne baan kunststof, een inrichting voor het uitvoeren van de werkwijze alsmede op een met de werkwijze
5 verkregen beklede band.

Er zijn althans twee werkwijzen bekend om een bekleed product omvattende een metalen substraat en een daaraan-gehechte kunststoflaag te vervaardigen, te weten filmlamineren en extrusiebekleden.

10 Bij filmlamineren wordt een gerede kunststoffilm afgerold en tegen het metalen substraat aangebracht.

Bij extrusiebekleden wordt een kunststofvel direct of vrijwel direct vanuit een extruder op het metalen substraat aangebracht.

15 Bij de eerste methode gaat men uit van een rol gerede film. Een probleem bij het maken van een rol film is het oprollen. De film heeft de neiging aan zichzelf te kleven zodat de wikkels aan elkaar komen te zitten. Doordat de film bovendien in de opgerolde toestand enigszins krimpt
20 moet de rol om deze weer beheerst te kunnen afrollen, losjes opgewikkeld worden. Door onvermijdelijke spanningen in de film treedt dan al snel randopbouw op, wordt de rol onrond en vertoont de film bij afwikkelen ruimtebanen. Een en ander heeft onder andere tot gevolg dat de film niet
25 met een voldoende hoge snelheid probleemloos kan worden afgerold; indien dit toch zou gelukken is daar nog het probleem dat bij hogere afrolsnelheden met elektrostatische ontladingsverschijnselen moet worden gerekend. Ter vermijding van dergelijke problemen worden
30 aan bijvoorbeeld huishoudfolies bepaalde additieven toegevoegd; deze oplossing biedt bij filmlamineren geen soelaas omdat de additieven het vermogen aan het metalen substraat te hechten ontoelaatbaar verminderen.

Op het eerste gezicht lijkt dan het extrusiebekleden een interessant alternatief, en dat is het ook voor een beperkt aantal toepassingen namelijk die waarbij de betreffende kunststof in gesmolten toestand de juiste

5 ~~hechtende eigenschappen heeft. Zodra dat niet - of in~~
onvoldoende mate - het geval is en er in de kunststof moleculen moeten worden ingebouwd die naar het oppervlak migreren om hechting te bewerkstelligen ontstaan bij extrusiebekleden - althans als een hoge bekledingssnelheid

10 gewenst is - de problemen. De migratie van hechtgroepen gaat namelijk alleen snel genoeg, i.e. binnen tienden van seconden, indien bij het bekleden een voldoende hoge temperatuur kan worden aangehouden. Dit is slechts bij bekleding aan één zijde van het substraat mogelijk. De

15 vereiste hoge temperatuur maakt het dan immers onmogelijk vervolgens de andere kant te bekleden aangezien de eerder aangebrachte bekleding bij tweede blootstelling aan de hoge temperatuur ontoelaatbaar beschadigt. Ook het niet volgtijdig maar gelijktijdig tweezijdig extrusiebekleden

20 biedt geen oplossing omdat de geringste substraatdikte-afwijking en de geringste procesverstoring bij het extrusiebekleden een instabiele bedrijfsvoering en dus aan weerszijden bekledingsverschillen en -inhomogeniteiten zouden veroorzaken.

25 De problemen die aan de geschetste procedures kleven worden opgelost althans verregaand teruggebracht indien volgens de uitvinding te werk wordt gegaan.

De werkwijze volgens de uitvinding is erdoor gekenmerkt dat deze in combinatie omvat de stappen

- 30 (i) in situ gieten van een kunststofbaan;
(ii) voeren van de kunststofbaan over een koelrol;
(iii) wegvoeren van de kunststofbaan totdat de kunststofbaanproductie op gang gekomen is en gestabiliseerd is;
- 35 (iv) op snelheid brengen van de kunststofbaan en het substraat en op een temperatuur brengen van het substraat welke temperatuur gelegen is in de buurt

van de verwekingstemperatuur van het naar het substraat gekeerde gedeelte van de kunststofbaan of daarboven;

- (v) aandrukken van de kunststofbaan tegen het substraat
5 en waar toepasselijk verbreken van de kunststofbaan en beëindigen van het wegvoeren ervan;
- (vi) met hoge snelheid bekleden van het substraat met de kunststofbaan.

Hiermede is bereikt dat op beheerste en economisch
10 rendabele wijze een aanzienlijk dunnere kunststoflaag op metaalband aan te brengen is.

De uitvinding is tevens belichaamd in een inrichting voor het continu bandbekleden van een metalen substraat met een kunststoflaag.

- 15 De uitvinding is tenslotte voorts belichaamd in een bandbekleed verpakingsstaal.

De uitvinding zal nu nader worden toegelicht aan de hand van de tekening omvattende figuren 1, 2 en 3 die elk een mogelijk lijnschema voor bekleden volgens de
20 uitvinding tonen, en enkele niet beperkende voorbeelden onder verwijzing naar de figuren.

Voorbeeld 1

Een ECCS-substraat 1 (ook wel TFS genoemd) met een dikte van 0,20 mm. Dit substraat is op een temperatuur van
25 230 °C gebracht, met behulp van verwarmingsmiddelen 2, bijvoorbeeld omvattende verwarmde geleide rollen en/of op basis van, inductie, hete lucht of anderszins. Aan beide zijden van het substraat 1 wordt een kunststofbaan 3 zoals een PET-kunststofbaan geproduceerd door gesmolten PET via
30 spuitkop 4, 4a op een intern watergekoelde gietrol 5, 5a te brengen. De afgekoelde PET-baan 3 wordt vervolgens naar de met rubber beklede aandrukrol 6 getransporteerd. Tijdens dit transport is diktemeting, kleurmeting, controle van de bandtrek en op de juiste breedte trimmen
35 mogelijk. De dikte van beide banen 3 bedraagt tussen de 3 en 100 mm. Vóór aanvang van het bekleden raken de aandrukrollen 6 het substraat 1 niet, en worden beide

banen afgevoerd, bijvoorbeeld opgerold op oprollers 7.

Om met bekleden te beginnen worden de aandrukrollen 6 gesloten, i.e. naar het substraat 1 bewogen.

PET-banen 3 hechten zich aan het substraat 1 en
5 ongeveer gelijktijdig worden de stukken baan 3 tussen
aandrukrol 6 en oproller 7 doorgeknipt. Het rubber van de
rollen 6 wordt extern gekoeld, bijvoorbeeld met een
metalen koelrol 8, of met een luchtmes op het
rubberoppervlak. De beklede band wordt vervolgens aan een
10 korte extra warmtebehandeling onderworpen tot 260 °C ter
optimalisatie van de hechting. Er ontstaat een goed
product, bijvoorbeeld in het bijzonder geschikt voor
deksels voor driedelige bussen.

Voorbeeld 2

15 Als in voorbeeld 1 maar nu is aan één zijde van het
substraat 1 de uit spuitmond 4a stromende kunststof een
tweelaags polypropreen, waarbij één der lagen, de
hechtlaag, maleïnezuuranhydride gemodificeerd polypropreen
is; aan de andere zijde van het substraat wordt via
20 spuitmond 4 en koelrol 5 een PET baan vervaardigd en
aangevoerd. De voorverwarmtemperatuur van het substraat 1
bedraagt in dit geval 200 °C. De dikte van beide banen
bedraagt tussen de 3 en de 100 mm. Tijdens het eerste
contact van de tweelaags baan met het substraat van 200
25 °C, een temperatuur boven de smelttemperatuur van poly-
propreen, ontstaat al enige hechting aan het substraat 1,
terwijl de polypropreen toplaag noch verkleeft met noch
beschadigd wordt door het rubber van de aandrukrol 6, dat
een temperatuur heeft van ca. 90 °C. Na ca. 1 seconde is
30 deze hechting aan het substraat 1 maximaal geworden. De
beklede band wordt vervolgens aan een korte extra
warmtebehandeling onderworpen, bijvoorbeeld tot 260 °C ter
optimalisatie van de hechting van zowel PET als
gemodificeerd PP. Er ontstaat een product, bijvoorbeeld in
35 het bijzonder geschikt voor kroonkurken van bierflesjes.

Voorbeeld 3

Als in voorbeeld 1 maar nu zijn beide kunststofbanen

van tweelaags polypropeen. Het substraat 1 is 0,10 mm dik ECCS en wordt op een temperatuur van 230 °C gebracht. Nu ontstaat een product met aan beide zijden een PP-laag. De hogere temperatuur dan in voorbeeld 2 is nodig omdat de
5 ~~warmte-inhoud van dun substraat gering is.~~ Het product is bijvoorbeeld in het bijzonder geschikt voor diervoeder-verpakkingen.

In de figuren 1, 2 en 3 zijn verschillende lijnschema's getoond volgens de uitvinding met een in-line
10 vervaardigde kunststofbaan bekleden van een metalen substraat. In fig. 2 is 20 een vacuüm kamer, 9 een elektrostatische randbegrenzer, 10 een luchtmes voor koeling, 11 een diktemeter, 12 een kantmes, 13 een snijafvalafzuiginstallatie, 14 een temperatuurmeter en 15
15 een oven voor verwarming van de beklede band.

Het is mogelijk de kunststofbaan te verstrekken bij een temperatuur gelegen boven de glastemperatuur en onder de verwekingstemperatuur van de kunststof; bij uni-axiale verstrekking is een rek van tot 400 % denkbaar. Indien
20 gewenst is het mogelijk de kunststofbaan van uitsparingen te voorzien.

Het zal voor de deskundige duidelijk zijn dat de uitvinding toegepast kan worden bij eenzijdig of tweezijdig bekleden van een metallisch substraat met aan
25 beide zijden dezelfde kunststof of aan beide zijden een verschillende kunststof bijvoorbeeld PET of polypropyleen of aan één zijde polypropyleen en de andere zijde PET.

CONCLUSIES

1. Werkwijze voor bandbekleden van een metallisch bandvormig substraat met een kunststofbaan omvattende de stappen
-
- (i) in situ gieten van een kunststofbaan;
- (ii) voeren van de kunststofbaan over een koelrol;
- (iii) wegvoeren van de kunststofbaan totdat de kunststofbaanproductie op gang gekomen is en gestabiliseerd is;
- (iv) op snelheid brengen van de kunststofbaan en het substraat en op een temperatuur brengen van het substraat welke temperatuur gelegen is in de buurt van de verwekingstemperatuur van het naar het substraat gekeerde gedeelte van de kunststofbaan of daarboven;
- (v) aandrukken van de kunststofbaan tegen het substraat en waar toepasselijk verbreken van de kunststofbaan en beëindigen van het wegvoeren ervan;
- (vi) met hoge snelheid bekleden van het substraat met de kunststofbaan.
2. Werkwijze volgens conclusie 1, met het kenmerk, dat na het aanbrengen van de kunststofbaan nog een extra verwarmingsstap volgt ter verbetering van de hechting.
3. Inrichting voor bandbekleden van een metallisch bandvormig substraat met een kunststofbaan, omvattende in combinatie:
- substraattransportmiddelen voor transport van metallisch substraat;
 - een aandrukrol voor het aandrukken van de kunststofbaan op het substraat;
 - gietmiddelen voor het gieten van de kunststof;
 - een koelrol voor het doen vormen van een

kunststofbaan;

- aanvoer- en geleidemiddelen voor het via de aandrukrol naar het substraat brengen van de kunststofbaan.

5

4. Inrichting volgens conclusie 3, met het kenmerk, dat de aandrukrol althans aan een oppervlak waarmede deze tijdens bedrijf in contact komt met de kunststofbaan van rubber is.
10
5. Inrichting volgens conclusie 3 of 4, met het kenmerk, dat de substraattransportmiddelen, de aandrukrol, de gietmiddelen, de koelrol en de aanvoer- en geleidemiddelen in hoofdzaak in tweevoud omvat en elk
15 enkelvoud aan weerszijden van waar zich tijdens bedrijf het substraat bevindt, voor het gelijktijdig tweezijdig bekleden van het substraat.
6. Van een organische hechtende laag voorziene
20 metaalband, met het kenmerk, dat de organische laag in hoofdzaak amorf PET omvat.
7. Band volgens conclusie 6, waarbij de organische laag een dikte heeft van minder dan 20 m.
- 25 8. Band volgens conclusie 6 of 7, waarbij de organische laag een dikte heeft van minder dan 15 m.
9. Band volgens conclusie 6, 7 of 8 waarbij de
30 organische laag een dikte heeft van minder dan 10 m.
10. Band volgens conclusie 6, 7, 8 of 9 waarbij de organische laag een dikte heeft van minder dan 5 m.
- 35 11. Band volgens een der conclusies 6-10, waarbij ten minste één laag uit twee of meer lagen kunststof bestaat met als toplaag een door kleurstoffen

9

UITTREKSEL

Werkwijze voor bandbekleden van een metallisch bandvormig substraat met een kunststofbaan omvattende de stappen

- (i) in situ gieten van een kunststofbaan;
- (ii) voeren van de kunststofbaan over een koelrol;
- (iii) wegvoeren van de kunststofbaan totdat de kunststofbaanproductie op gang gekomen is en gestabiliseerd is;
- (iv) op snelheid brengen van de kunststofbaan en het substraat en op een temperatuur brengen van het substraat welke temperatuur gelegen is in de buurt van de verwekingstemperatuur van het naar het substraat gekeerde gedeelte van de kunststofbaan;
- (v) aandrukken van de kunststofbaan tegen het substraat en waar toepasselijk verbreken van de kunststofbaan en beëindigen van het wegvoeren ervan;
- (vi) met hoge snelheid bekleden van het substraat met de kunststofbaan.

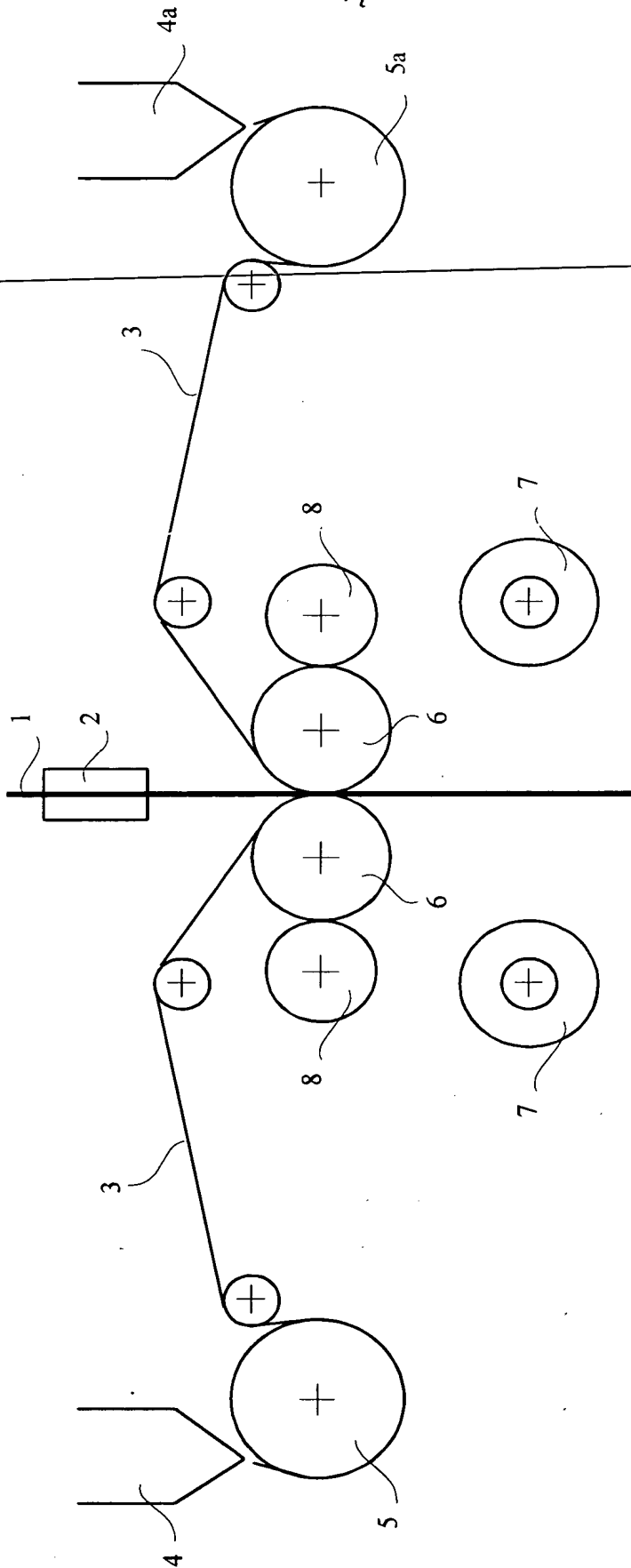


Fig.1

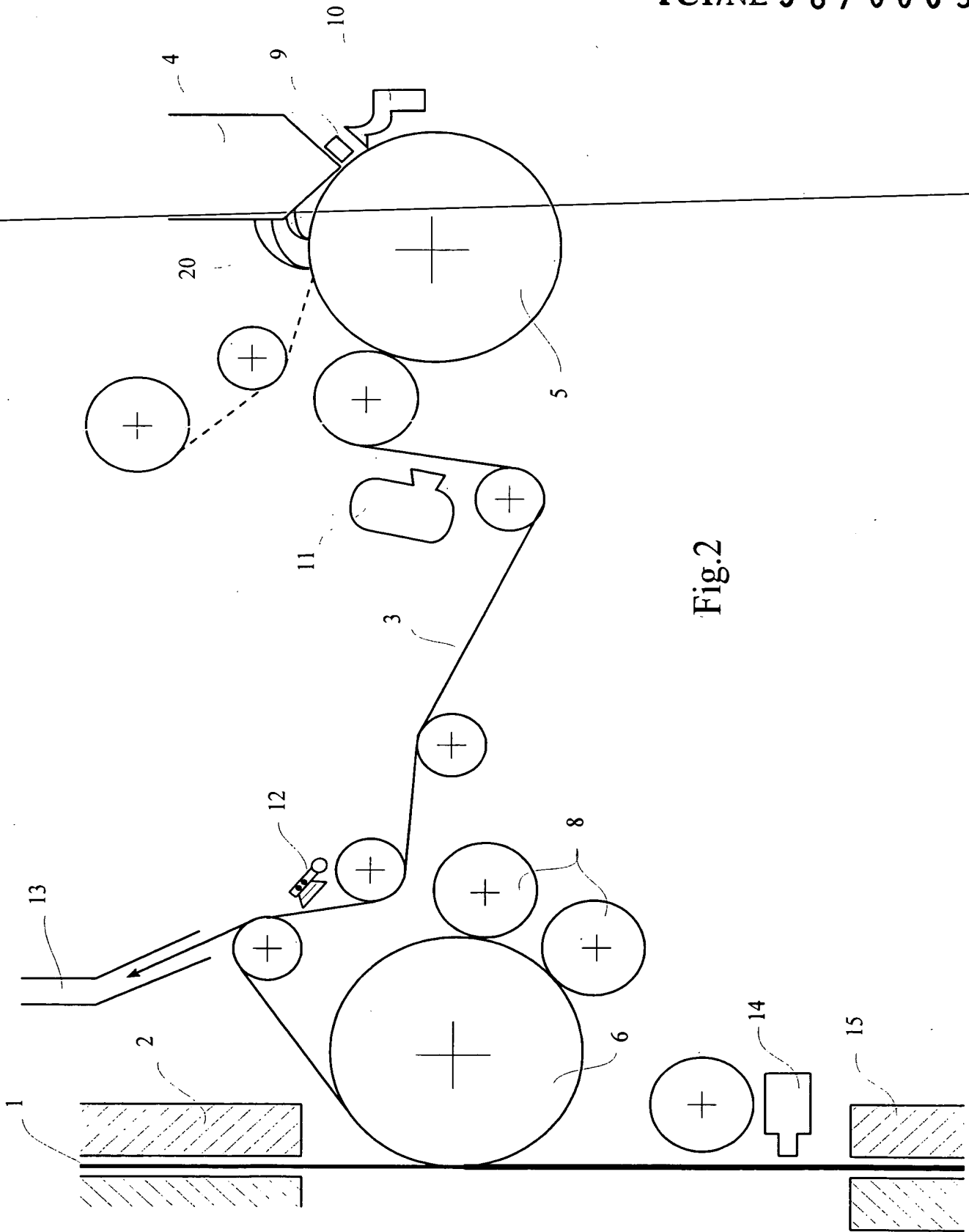


Fig.2

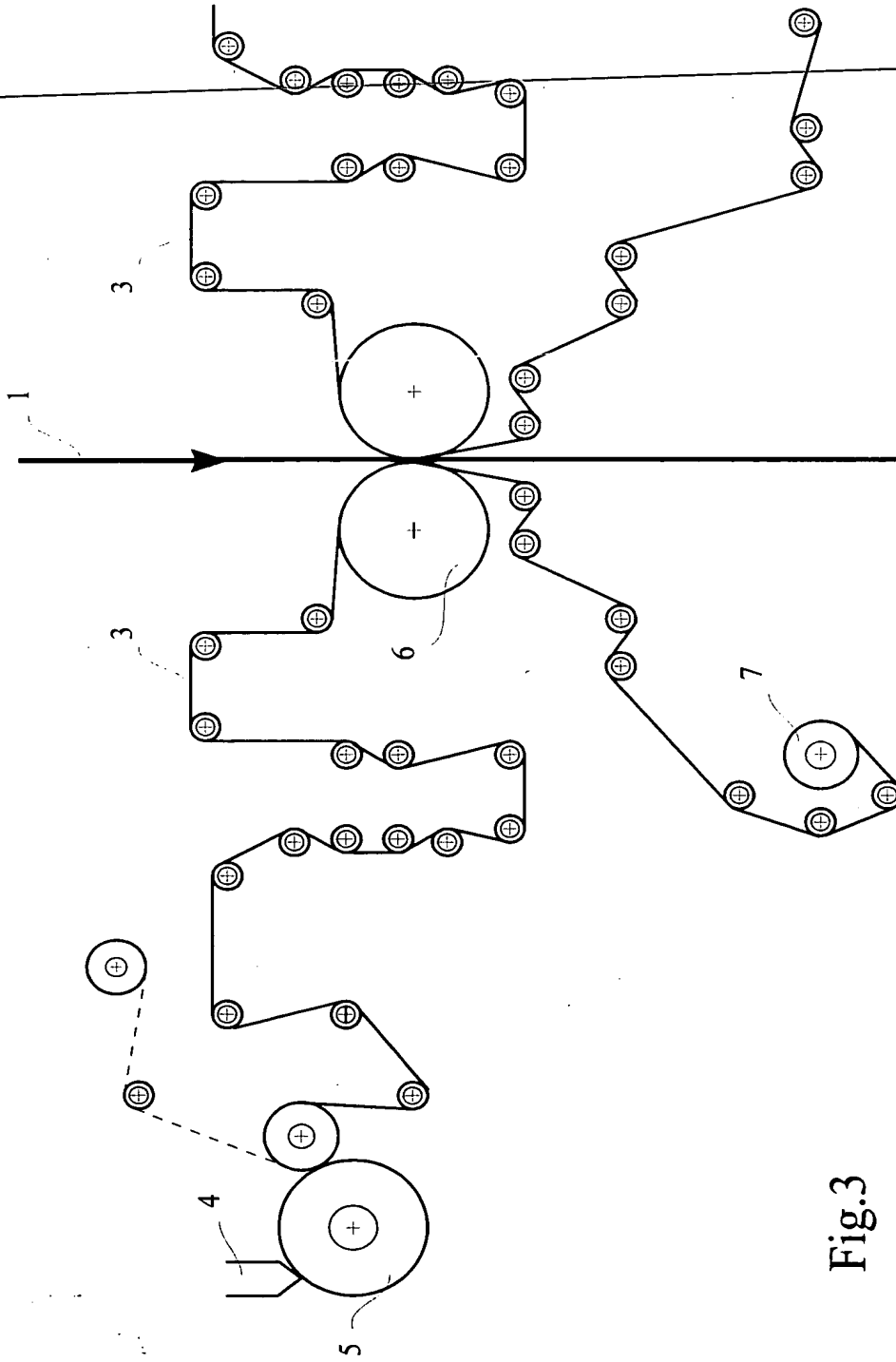


Fig.3